

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
1 April 2004 (01.04.2004)

PCT

(10) International Publication Number  
**WO 2004/027489 A1**

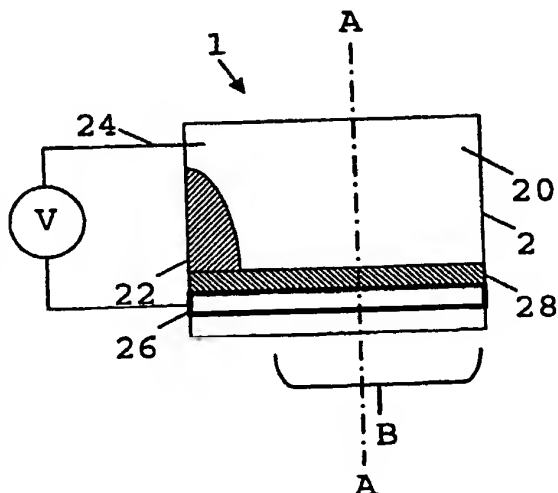
- (51) International Patent Classification<sup>7</sup>: **G02B 26/02**
- (21) International Application Number:  
PCT/IB2003/003927
- (22) International Filing Date:  
12 September 2003 (12.09.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
02078939.2 19 September 2002 (19.09.2002) EP
- (71) Applicant (for all designated States except US): **KONIN-  
KLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL];  
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **FEENSTRA,  
Bokke, J.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA  
Eindhoven (NL). **HAYES, Robert, A.** [AU/NL]; c/o Prof.  
Holstlaan 6, NL-5656 AA Eindhoven (NL). **SNOEREN,  
Rudolph, M.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656  
AA Eindhoven (NL). **KUIPER, Stein** [NL/NL]; c/o Prof.  
Holstlaan 6, NL-5656 AA Eindhoven (NL). **HENDRIKS,  
Bernardus, H., W.** [NL/NL]; c/o Prof. Holstlaan 6,  
NL-5656 AA Eindhoven (NL). **VAN ARENDONK,  
Anton, P., M.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656  
AA Eindhoven (NL).
- (74) Agent: **VISSER, Derk**; Philips Intellectual Property &  
Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven  
(NL).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,  
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,  
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,  
MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT,  
RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

## Declaration under Rule 4.17:

— as to applicant's entitlement to apply for and be granted  
a patent (Rule 4.17(ii)) for the following designations AE,  
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH,  
CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES,  
FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH,  
PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN,  
TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO  
patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG,  
ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU,  
TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE,  
DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT,  
RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

[Continued on next page]

(54) Title: SWITCHABLE OPTICAL ELEMENT



(57) **Abstract:** A switchable optical element is described,  
along with a method of manufacturing such an element. The  
switchable optical element (1) comprises a fluid chamber (2)  
including immiscible first and second bodies of fluid (20, 22)  
disposed relative to one another along an optical axis (A) of  
the element (1). The second body of fluid (22) is movable in  
a direction away from the optical axis (A) by electro-wetting  
action, giving the switchable optical element (1) a changeable  
transmissivity along the optical axis (A). The switchable  
optical element (1) is suitable for use as an optical attenuator,  
e.g. a shutter, filter or diaphragm, and can be conveniently  
used in place of mechanical alternatives in applications such  
as cameras, laser resonant cavities, projectors and devices for  
scanning optical record carriers.